DHCP and Router Advertisement Options for Encrypted DNS Discovery

https://tools.ietf.org/html/draft-ietf-add-dnr

March 2021

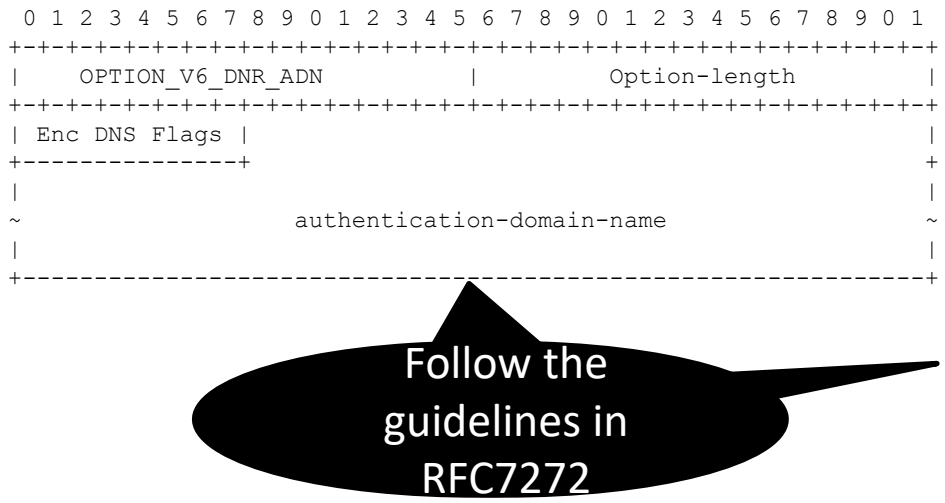
M. Boucadair (Orange)
T. Reddy (McAfee)
D. Wing (Citrix)
N. Cook (Open-Xchange)
Tommy Jensen (Microsoft)

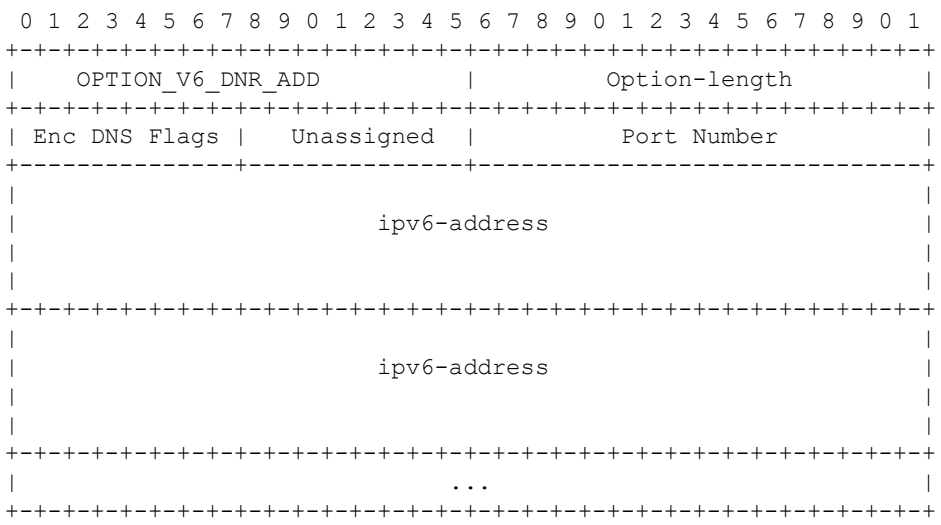
DNR Design Assumptions

- ***One or more encrypted DNS servers*** can be advertised by a network, e.g., DoT+DoQ+DoH
- The ***same or distinct*** Authentication Domain Names may be used for DoT, DoH, DoQ, etc.
- Available encrypted DNS servers may run on the ***same or distinct IP addresses***
- An encrypted DNS service (e.g., DoT, DoQ) may use a ***non default port number***

Overall Approach

- Rely upon existing mechanisms to distribute the DNS server information: DHCP, DHCPv6, and RA
- Return the ***minimal information*** to establish a connection with an encrypted DNS server
- Two options are defined





Typical Communication Flow

- Clients ask for one or more encrypted DNS (e.g., DoT, DoH) by ***setting dedicated flags*** in the options
  - A client that is interested in any encrypted DNS will set all the flags
- Servers reply with ADN(s), a list of IP addresses, and a port number, if the requested encrypted DNS is supported
  - It is ***RECOMMENDED to return both an ADN + a list of IP addresses***
  - ***One or more*** encrypted DNS types may be returned
  - These services may be bound to the ***same or distinct IP addresses***
  - ***Alternate port numbers*** can be returned when default port number are not in use
  - If a list of IP addresses is returned, that list is ***ordered***
  - Some recommendations to ***optimize*** the message size are included

Relationship with DDR

"Upon discovery of a DoH resolver (Sections 4, 5, and 6), the DoH client may contact that DoH resolver to retrieve the list of supported DoH services using DEER [I-D.pauly-add-deer]. This will allow the client to discover the resolver's supported DoH templates or DoH resolvers that the discovered resolver designates using DNS SVCB queries [I-D.schwartz-svcb-dns]. The designated DoH resolvers and DoH resolver discovered using DHCP/RA may be hosted on the same or distinct IP addresses."

Issue #1: Why Defining Two Options?

- The initial design in 05/20 proposed ***the ADN option only*** while the address is conveyed in the legacy Do53 @ List

- That design was abandoned because it was suboptimal:
  - It requires ***probing*** if the designated encrypted DNS services are not available on the same IP address(es)
  - It requires ***falling back to Do53*** to discover the IP addresses and the alternate port number
  - It does ***not meet the updated design requirements***: Alternate port number can't be discovered

Issue #2: No @List is Returned

- If the client receives a Do53 @List and an ADN, should the client use that list to resolve the ADN or should that list be assumed as locators to reach encrypted DNS servers?

Suggestion:
- Recommend to always return a list of @es, unless Do53 and encrypted DNS terminate on the same @es

Motivation:
- Optimize the message size

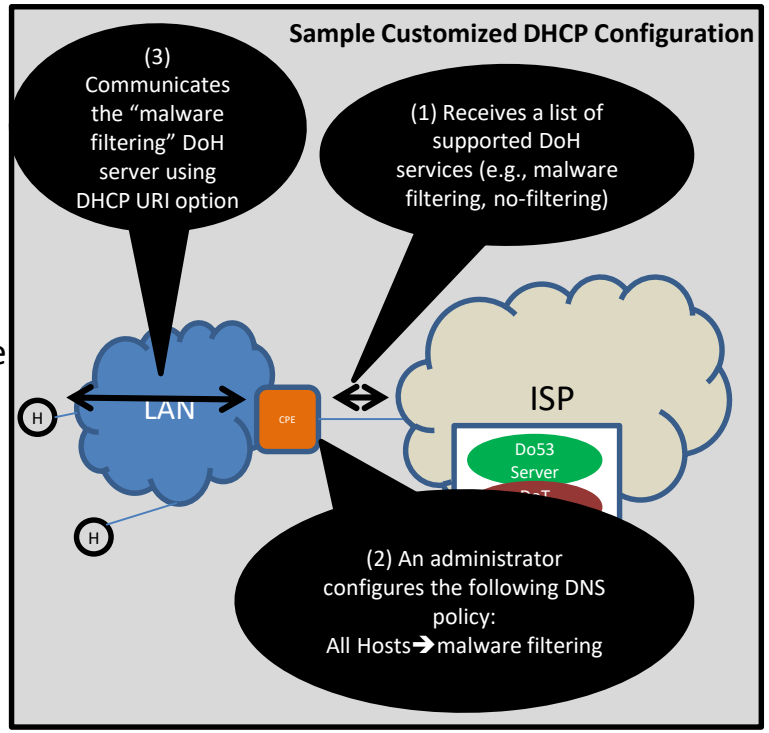
Issue #3: DNR Options Should be Isomorphic to DDR Information?

- Authenticated DDR mode requires an ADN to be discovered and a Locator where to reach the designated resolver
  - Designated servers may not run on the same IP@ and non-default port numbers may be used

- What additional information do we need to convey in the options?
  - URI Templates?

Issue #4: URI Templates in RA/DHCP?

- Why?
  - Provide a customized DNS configuration within a local network
- There are trade-offs
  - Some issues
    - May ***increase the size*** of RA/DHCP messages
  - Some advantages
    - Fills a void as there is ***no standard*** means to retrieve the URI information from the DoH server
    - Clients can ***immediately use*** the service(s); no need for extra queries to retrieve the URIs
    - Avoids Do53 lookups
    - Does ***not interfere*** with DNS exchanges to "customize" the available services
    - It is not subject to ***external attacks***
    - Avoids the client to fallback to SUDN (opportunistic encryption)



Suggestions:

- Define RA/DHCP options to convey URI Templates
- These options, when available, take precedence over DEER

Next Steps

- Implement the outcome of the discussion
- Edits and clarification to take into account Michael's comments
  - https://github.com/boucadair/draft-btw-add-home-network/issues/7
- Please review and share comments